



FP-35A

FIREPOWER® PLASMA CUTTING SYSTEM



Art # A-04502

Service Manual

Version No: 1

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Manual 0-4695

Operating Features:



**35
AMP**



**1
PHASE**

**230
V**

TABLE OF CONTENTS (continued)

SECTION 1:	
GENERAL INFORMATION	1-1
1.01 Notes, Cautions and Warnings	1-1
1.02 Important Safety Precautions	1-1
1.03 Publications	1-3
1.04 Declaration of Conformity	1-4
1.05 Statement of Warranty	1-5
SECTION 2:	
INTRODUCTION	2-1
2.01 Overview	2-1
2.02 General Specifications	2-1
2.03 Torch Specifications	2-2
2.04 System Contents	2-2
2.05 Transporting Methods	2-2
SECTION 3:	
INSTALLATION	3-1
3.01 Site Selection	3-1
3.02 Electrical Input Connections	3-1
3.03 Compressed Air Connection	3-1
SECTION 4:	
OPERATION	4-1
4.01 Front Control Panel	4-1
4.02 Preparations For Operating	4-2
SECTION 5: MAINTENANCE	5-1
5.01 General Maintenance	5-1
5.02 Maintenance - Torch O-Rings	5-2
SECTION 6:	
TROUBLESHOOTING	6-1
6.01 Setup and Operation	6-1
6.02 Basic Trouble Shooting Guide	6-2
6.03 Control PCB Indicators	6-3
6.04 Open Circuit Voltage Check	6-4
6.05 Detailed Fault Finding / Error Indicators	6-4
6.06 Torch Tests	6-8
SECTION 7:	
PARTS LIST	7-1
Appendix 1: Operating Sequence, Block Diagram	A-1
Appendix 2: Torch Connection	A-2
Appendix 3: Microchip Pin-Out	A-3
Appendix 4: System Schematic	A-4

SECTION 1: GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

NOTE

An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION

A procedure which, if not properly followed, may cause damage to the equipment.



WARNING

A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.02 Important Safety Precautions



WARNINGS

OPERATION AND MAINTENANCE OF PLASMA ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.



GASES AND FUMES

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Arsenic	Cobalt	Nickel
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	Vanadium

- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.

- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Sec. 25249.5 et seq.)



ELECTRIC SHOCK

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.



FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. **DO NOT**

cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.



NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.



PLASMA ARC RAYS

Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.

- Use the shade of lens as suggested in the following per ANSI/ASC Z49.1:

Arc Current	Minimum Protective Shade No.	Suggested Shade No.
Less Than 300*	8	9
300 - 400*	9	12
400 - 800*	10	14

* These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

1.03 Publications

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.04 Declaration of Conformity

Manufacturer: Thermal Dynamics Corporation
Address: 82 Benning Street
West Lebanon, New Hampshire 03784
USA


The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEC as amended by Council Directive 93/68/EEC) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- * CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.
- * UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- * CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.
- * ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.
- * For environments with increased hazard of electrical shock, Power Supplies bearing the  mark conform to EN50192 when used in conjunction with hand torches with exposed cutting tips, if equipped with properly installed standoff guides.
- * Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermal Dynamics has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative: Steve Ward
Operations Director
Thermadyne Europe
Europa Building
Chorley N Industrial Park
Chorley, Lancashire,
England PR6 7BX



1.05 Statement of Warranty

LIMITED WARRANTY: Subject to the terms and conditions established below, Thermadyne® Corporation warrants to the original retail purchaser that new Thermadyne CutSkill Series plasma cutting systems sold after the effective date of this warranty are free of defects in material and workmanship. Should any failure to conform to this warranty appear within the applicable period stated below, Thermadyne Corporation shall, upon notification thereof and substantiation that the product has been stored operated and maintained in accordance with Thermadyne's specifications, instructions, recommendations and recognized industry practice, correct such defects by suitable repair or replacement.

This warranty is exclusive and in lieu of any warranty of merchantability or fitness for a particular purpose.

Thermadyne will repair or replace, at its discretion, any warranted parts or components that fail due to defects in material or workmanship within the time periods set out below. Thermadyne Corporation must be notified within 30 days of any failure, at which time Thermadyne Corporation will provide instructions on the warranty procedures to be implemented.

Thermadyne Corporation will honor warranty claims submitted within the warranty periods listed below. All warranty periods begin on the date of sale of the product to the original retail customer or 1 year after sale to an authorized Thermadyne Distributor.

LIMITED WARRANTY PERIOD

Product	Power Supply Components (Parts and Labor)	Torch and Leads (Parts and Labor)
FP-20A	1 Year	1 Year
FP-35A	1 Year	1 Year
FP-70A	1 Year	1 Year
FP-100A	1 Year	1 Year

This warranty does not apply to:

1. Consumable Parts, such as tips, electrodes, shield cups, o - rings, starter cartridges, gas distributors, fuses, filters.
2. Equipment that has been modified by an unauthorized party, improperly installed, improperly operated or misused based upon industry standards.

In the event of a claim under this warranty, the remedies shall be, at the discretion of Thermadyne Corporation:

1. Repair of the defective product.
2. Replacement of the defective product.
3. Reimbursement of reasonable costs of repair when authorized in advance by Thermadyne.
4. Payment of credit up to the purchase price less reasonable depreciation based on actual use.

These remedies may be authorized by Thermadyne and are FOB West Lebanon, NH or an authorized Thermadyne service station. Product returned for service is at the owner's expense and no reimbursement of travel or transportation is authorized.

LIMITATION OF LIABILITY: Thermadyne Corporation shall not under any circumstances be liable for special or consequential damages such as, but not limited to, damage or loss of purchased or replacement goods or claims of customer or distributors (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermadyne with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of the goods covered by or furnished by Thermadyne whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which liability is based.

This warranty becomes invalid if replacement parts or accessories are used which may impair the safety or performance of any Thermadyne product.

This warranty is invalid if the Thermadyne product is sold by non - authorized persons.

Effective August 28, 2005

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SECTION 2: INTRODUCTION

General Information

This Service Manual and parts list covers the FirePower® Model FP-35A Plasma Cutting Power Supply. Do not use these instructions or parts on any other equipment.

Provide the power supply model number and serial number when ordering parts.

If a product must be returned for service, contact your distributor. Materials returned without proper authorization will not be accepted.

Contact Information

Thermal Dynamics Technical Service Dept.

Tel: 1-800-752-7622 (1-800-PLASMA2)

Fax: 1-800-221-4401

e-mail address: tdc-tech@thermadyne.com

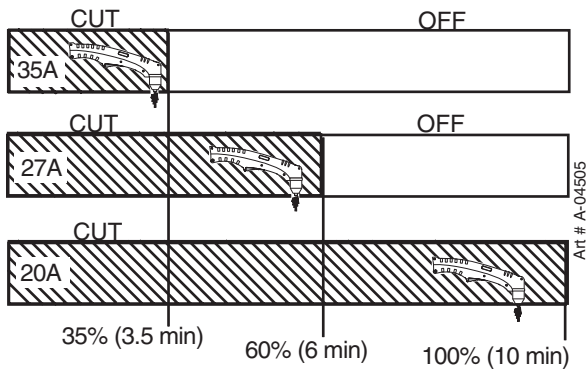
Replacement parts are shown on the following pages. Catalog numbers are shown below each part.

2.01 Overview

Plasma is a gas which has been heated to an extremely high temperature and ionized so that it becomes electrically conductive. The plasma arc cutting process uses this plasma to transfer an electrical arc to the workpiece. The metal to be cut is melted by the heat of the arc and then blown away.

2.02 General Specifications

System Descriptions	FP-35A
Maximum Output	35 Amps
Input Voltage & Phase	230V, Single Phase
Frequency	50/60Hz
Input Power	7.4 kVA
Current Input Fuse	20 Amps
No Load Voltage	330V
Load Voltage	94V
Output Current	15-35 Amps
Post Flow Time	10 Seconds
Operating Air Pressure	75 psi (5.2 bar)
Maximum Air Pressure	125 psi (8.6 bar)
Air Flow	400 scfh 6.6 scfm (188.7 lpm)
System *Duty Cycle ratings at Ambient Air Temperatures of 40° C / 104° F.	35% @ 35Amps
System *Duty Cycle ratings at Ambient Air Temperatures of 40° C / 104° F.	60% @ 27Amps
System *Duty Cycle ratings at Ambient Air Temperatures of 40° C / 104° F.	100% @ 20Amps
Maximum Cutting Capacity @ 35A	1/2" (12mm)
Dimension (W x D x H)	8.3"x20"x14.8" (210 mm x 510 mm x 350 mm)
Net Weight	44 lbs. (20kg)



NOTE:

**Duty Cycle is the percentage of time the system can be operated without overheating. Duty cycle is reduced if primary input voltage (AC) is low or the DC voltage is higher than shown in previous chart.*

2.03 Torch Specifications

SL60™ 1Torch™ Ratings for FP-35A	
Torch Configuration	Torch Head at 75° to Torch Handle
Torch Leads Length	20 feet (6.1 m)
Ambient Temperature	104° F 40° C
Torch Duty Cycle	100% @ 60 Amps @ 400 scfh
Maximum Current	60 Amps, DC, Straight Polarity
Voltage (V _{peak})	500V
Arc Striking Voltage	7kV
Type of Cooling	Ambient air and gas stream through torch
Parts-in-Place:	Built-in Switch in Torch Head
Gas Requirement:	Single Gas, Compressed Air Only
Input Gas Pressure	75 psi (5.2 bar) - 125 psi (8.6 bar)
Minimum Gas Flow	400 scfh / 6.6 scfm (188.7 lpm)
Plasma Power Supply Used With:	FP-35A

2.04 System Contents

ITEMS	Description	Q'ty
Power Source	Model FP-35A	1
Torch Set	SL60™, with 20' leads (6.1m)	1
Accessories & Consumables	Air Regulator	1
	Work Cable	1
	Manual	1
	Torch Electrodes	2
	Torch Tips	3
Input Power Cable	3 Meter NEMA 10 AWG / 4.8 mm ² with 6 - 50 P molded plug	1

2.05 Transporting Methods

Lift unit with handle on top of case. Use handcart or similar device of adequate capacity for transporting.



WARNINGS

ELECTRIC SHOCK can kill. DO NOT TOUCH live electrical parts. Disconnect input power from supply before moving the power source.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

SECTION 3: INSTALLATION

3.01 Site Selection

- Place in a clean and dry area.
- Provide adequate ventilation and fresh air supply.
- Ideal ambient temperature should not exceed 40°C / 104°F. Temperatures exceeding that may diminish cutting capacity or quality.
- The cutting machine must be placed on an even, firm surface so that it stands firmly.

3.02 Electrical Input Connections

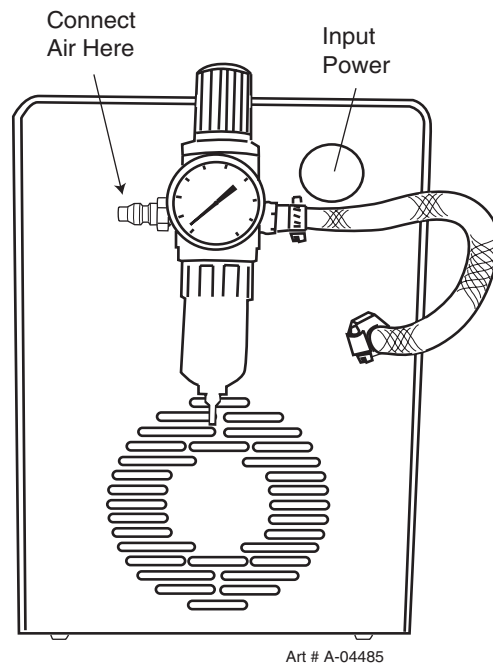
- Input voltage is 230V \pm 10%, 50/60 Hz single phase.

CAUTION

Check your power source for correct voltage before plugging in or connecting the unit. The primary power source, fuse, and any extension cords used must conform to local electrical code and the recommended circuit protection and wiring requirements as specified in Section 2.0.

3.03 Compressed Air Connection

- An air compressor is required and should be connected to rear panel of power source by air hose.
- Air pressure should be 75 psi (5.2 bar) and air should be dry and clean.
- Air flow should be 400 scfh / 6.6 scfm (188.7 lpm) minimum.



DANGER

Do not cut in humid or wet surroundings.

- Before you maintain or replace torch parts, wait for the post flow air cycle (approximately 10 seconds), to stop, then turn the machine off.
- Always use original manufacturers parts. The use of aftermarket parts could result in shorter parts life and in unsatisfactory cutting results. Any warranty claims would be waived.

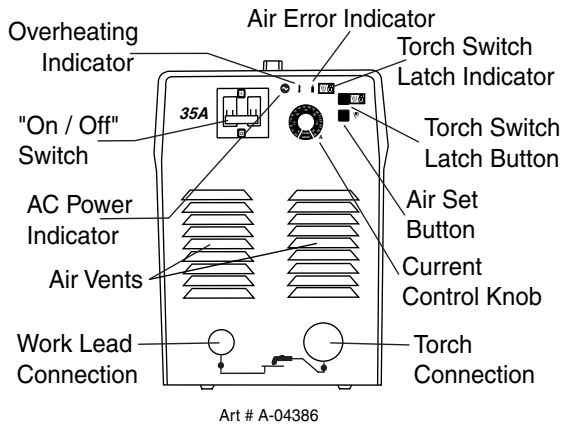
NOTE

Repairs must be done by skilled and qualified personnel only.




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SECTION 4: OPERATION

4.01 Front Control Panel




A. Indicator Lamp

- Power Indicator 
Lights when primary power switch is turned on.
- TEMPERATURE Indicator 
Indicator is normally OFF. Indicator is ON when internal temperature exceeds normal limits.
- Air Error Indicator 
This indicator lights and is accompanied by an intermittent audible tone when there is not enough air pressure to operate the power supply. Indicator is normally off.

NOTE

It is possible to have enough air pressure to operate the power supply but not enough air flow to operate the torch.

- Torch Switch Latch Indicator 
This indicator lights when the Torch Switch Latch Button has been pressed for continuous cutting.

B. Buttons

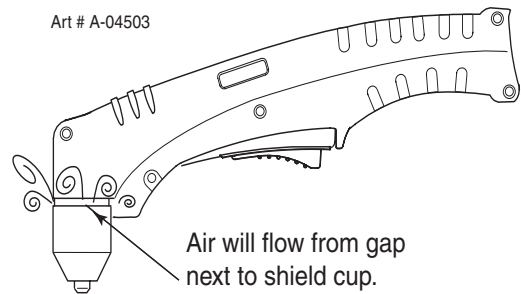
- Torch Switch Latch Button 

For continuous cutting performance. Depress this button (turn "On") while cutting with the torch. Release the torch trigger and the torch will continue to cut without depressing the torch trigger.

- Air Set Button 

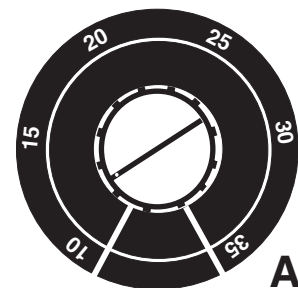
To adjust air pressure and to cool down heated torch.

Art # A-04503



C. Main Current Control Knob

To adjust cutting current. Turning clockwise increases the cutting current and counter clockwise decreases the cutting current.



Art # A-04387

D. Primary Power Switch, ON / OFF

The power switch is located on the front panel. Placing the primary power switch to the "ON" position energizes the power source and activates the Power Indicator.



WARNING

When the power source is overloaded, the switch turns to the OFF position automatically. DO NOT TURN ON BY FORCE.

4.02 Preparations For Operating

At the start of each operating session:

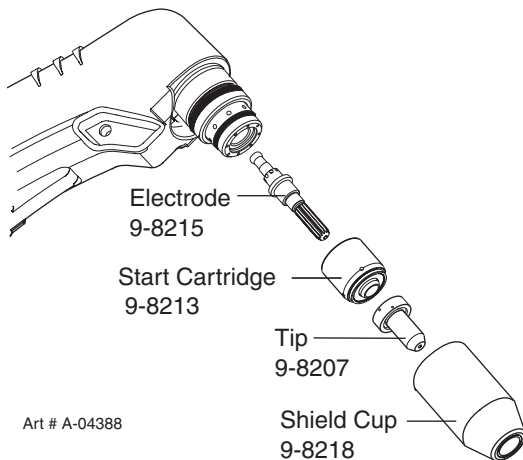


WARNING

Disconnect primary power at the source before assembling or disassembling power supply, torch parts, or torch and leads assemblies.

A. Torch Parts Selection

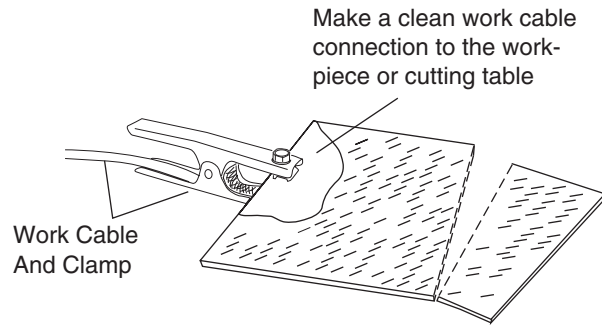
Check the torch for proper assembly and appropriate torch parts. The torch parts must correspond with the type of operation, and with the amperage output of this Power Supply (35 amps maximum). Use only genuine manufactured parts with this torch.



B. Torch Connection

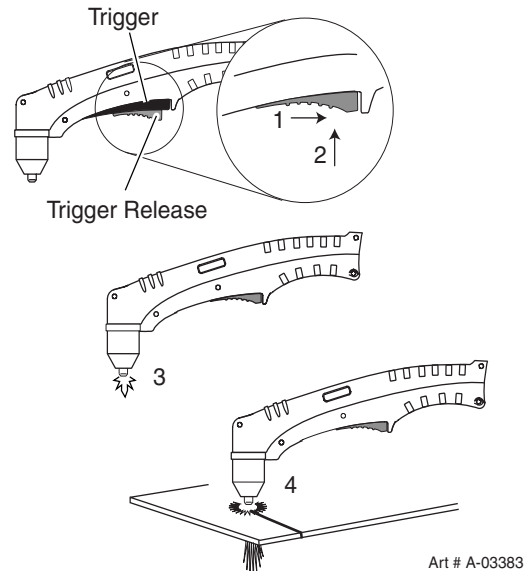
Check that the torch is properly connected.

C. Connect Work Cable



D. Torch Operation

- Refer to Section 1 for necessary safety precautions.



E. Typical Cutting Speeds

Cutting speeds vary according to torch output, the type of material being cut, and operator skill. Speeds shown are typical for this cutting system using air plasma to cut mild steel, with output current at the highest setting and the torch used in the Drag mode or standoff height indicated.

Unit	Standoff	Material Thickness	Maximum Travel Speed (ipm , mm/m)		Recommended Travel Speed (imp , mm/m)	
FP-35A	Drag	(10GA) 0.135" (3mm)	94.7	2367	75.7	1893
FP-35A	Drag	(7GA) 0.179" (4.5mm)	57.0	1425	45.6	1140
FP-35A	1/8" (3mm)	1/4" (6mm)	36.3	908	29.1	727
FP-35A	1/8" (3mm)	3/8" (10mm)	15.3	383	12.3	307
FP-35A	1/8" (3mm)	1/2" (12mm)	9.7	242	7.7	193


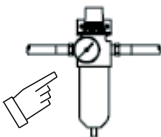
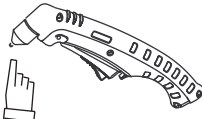
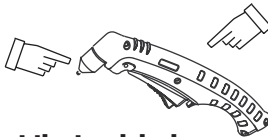
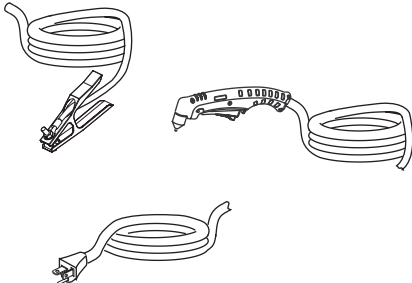
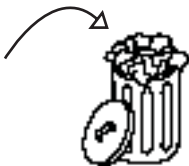
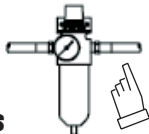
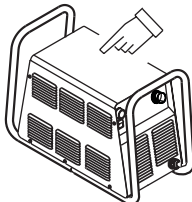
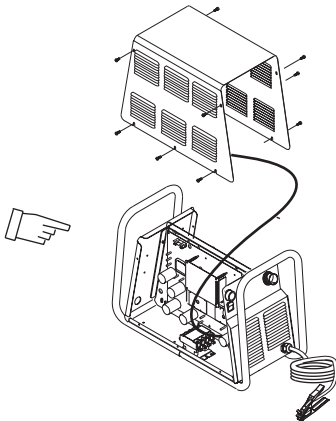
NOTE:

Drag or Drag mode refers to the torch tip being in contact with the work piece at all times.

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SECTION 5: MAINTENANCE

5.01 General Maintenance

<div><div>Warning! Disconnect input power before maintaining.</div></div> <div>Maintain more often if used under severe conditions</div>		
Each Use		
Visual check of regulator and pressure		Visual check of torch tip and electrode
		
Weekly		
Visually inspect the torch body tip, electrode and shield cup		Visually inspect the cables and leads. Replace as needed
		
3 Months		
Replace all broken parts		Gas and air lines
		
Clean exterior of power supply		
6 Months		
Visually check and Carefully clean the interior		

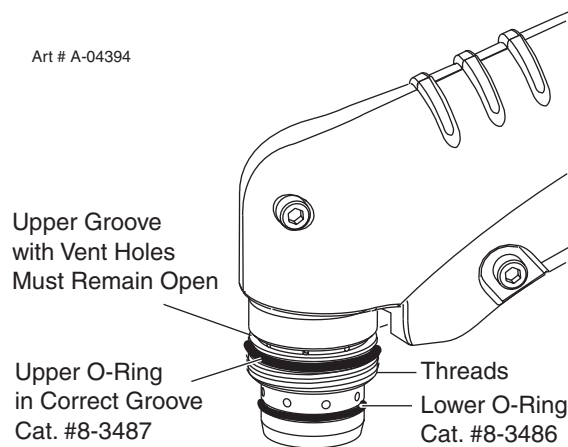
5.02 Maintenance - Torch O-Rings

O-rings on the Torch require lubrication on a regular basis, depending on how frequently the torch shield cup is disconnected and re-connected. This will allow the O-rings to remain pliable and provide a proper seal. The O-rings will dry out, becoming hard and cracked, if the O-ring lubricant is not used on a regular basis. This can lead to potential performance problems.

Remove and apply a very light film of O-ring lubricant (Catalog # 8-4025) to the O-rings on a weekly basis.

NOTE

DO NOT use other lubricants or grease on the torch O-rings. They may not be designed to operate within high temperatures or may contain “unknown elements” that may react with the atmosphere. This reaction can leave contaminants inside the torch. Either of these conditions can lead to inconsistent performance or poor parts life.



SECTION 6: TROUBLESHOOTING




WARNING


There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

NOTE:

All procedures are done with the cover removed.

6.01 Setup and Operation

1. Connect the unit to air supply and power.
2. Connect the work lead clamp to cleaned area of work surface.
3. Turn the switch located on the front panel, to the "On" position. The  A/C indicator on the front panel should light.

4. Set the air pressure. Press the Air Set Button  and set the regulator pressure to 75 psi (5.2 bar) (.52 MPa).

Air should be flowing continuously. Press the Air Set Button  again to stop the air flow.

NOTE:


If the Air Error Indicator light is on, and or there is an audible beeping tone, check for low or no air pressure.

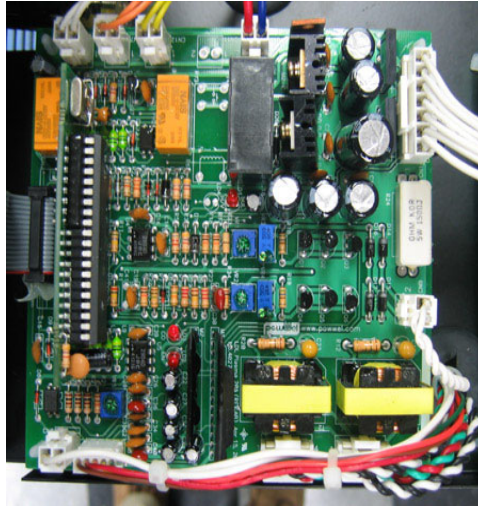
5. Squeeze the torch trigger (slight delay), pilot arc starts.
6. Transfer arc to work surface.

6.02 Basic Trouble Shooting Guide


Problem - Symptom	Possible Cause	Recommended Action
Power Switch is on but the A/C Indicator does not light	1. Improper electrical connection. 2. System was overloaded. 3. Switch may be faulty	1. Check input power source and fuse. Check input cable and connections. 2. Turn Primary Power Switch Off and then On again. 3. Return to authorized service center for repair or replacement
Primary power switch is on, but the cooling fan does not work.	1. No power or incorrect power to fan. 2. Faulty fan.	1. Check electrical connections to fan. 2. Return to authorized service center for repair or replacement
No air flow at torch when air check switch is turned on.	1. Input air connection is disconnected. 2. Air source is not on. 3. Internal connection is loose 4. Filter or Control PCB is faulty	1. Connect the input air. 2. Check the compressor and manufacturers manual for trouble shooting and follow local maintenance procedures. 3. Check all air line connections and fittings. 4. Return to an authorized service center for repair.
Torch will not pilot when torch switch is activated.	1. Gas pressure too high or too low. 2. Torch tip, start cartridge, or electrode missing. 3. Start Cartridge is stuck 4. Worn or faulty torch parts 5. Thermal Switch activated	1. Adjust gas pressure per pressure setting label on power supply. 2. Turn off power supply. Remove shield cup. Install missing parts. 3. Turn off power supply. Remove shield cup, tip, and start cartridge. Check lower end fitting on start cartridge for free movement. Replace cartridge if lower end fitting does not move freely. 4. Inspect torch consumable parts. Replace if necessary. 5. Allow the cooling fan to run for 2 minutes or longer until it will resume operation.
Pilot / transfer arc goes out and doesn't reactivate	1. Torch removed from work piece or moved away from metal being cut	1. Release torch trigger and re-establish the pilot arc. See block diagram Appendix 1
Cut performance is diminished.	1. Worn torch parts. 2. Poor Work Lead connection. 3. Current sensor or PWM PCB faulty.	1a. Check current setting. Check the Electrode and Tip for excess wear. 1b. Check that the lower end fitting on the start cartridge moves freely. Replace any or all parts as needed. 2. Check the connection of the Work Lead to the work piece. 3. Return to an authorized service center for repair or replacement.
Air flows continuously and torch switch latch button doesn't work properly.	1. Torch Switch Latch button on front panel faulty. 2. Control PCB faulty.	1. Return to an authorized service center for repair or replacement. 2. Return to an authorized service center for repair or replacement.

6.03 Control PCB Indicators

1. Turn the switch located on the front panel, to the "On" position. The  A/C indicator on the front panel should light.
2. Locate the Control PCB behind the front panel. LD2 (EN) LED's should be "ON".



Control PCB

3. Press the Air Set Button . The LD1 (SOL) LED should light. Press the Air Set Button again and it should go out.
4. Squeeze the torch trigger (slight delay), pilot arc starts. LD2 (EN) should brighten and LD1 (SOL) LED should be on.
5. Transfer the arc to the work surface and (LD3) should come on so that all three LEDs are on.


NOTE:

If no transfer of arc occurs, check the work lead connection.

6.04 Open Circuit Voltage Check

1. Attach shop air to unit.
2. Remove torch consumables from torch head and replace the shield cup.
3. Turn unit power on.
4. Measure Thermal TB2 Pins 1 and 3. It should be 220VAC.
5. Measure output voltage on bridge diode (red and black). It should be 325VDC.
6. Depress the torch trigger.
7. Check for illumination of the "SOL" LED and that the "EN" (Enable) LED brightens on the Logic PCB.
8. Measure output to Main Transformer Input. It should be 218VAC.
9. Measure Main Transformer secondary voltage. It should be 315VAC.
10. Measure output OCV to work. It should be 325VDC.
11. Turn off the unit power and replace the torch consumables removed in step 2 above.

6.05 Detailed Fault Finding / Error Indicators

Problem	Check / Test	Recommended Action
 Air Indicator is on and or audible intermitant tone	If the air supply and regulator setting are OK, check the Pressure Switch	1 - Replace Pressure Switch if needed. 2 - If the Pressure Switch is OK then replace the Control PCB
Torch doesn't Pilot and the LD1 LED light on the Control PCB is on	1 - Check torch consumables. 2 - Check all air supply related issues before proceding. 3 - Check LD2 (EN) LED it should get brighter with the torch trigger depressed. 4 - Check OCV Voltage. If OCV Voltage is OK check C/T 1 connection	1 - Replace torch consumables as needed. 2 - Change air related items as needed. 3 - If OCV is not OK, follow OCV check procedures in section 6.04 4 - If C/T 1 connection is OK, replace the Control PCB
Torch doesn't Pilot and the LD1 LED on the Control PCB is not on	Check all air supply related issues before proceding.	If there are no air related issues, replace the Control PCB
"CO" LED on Control PCB comes on when not transferring.	Check Cable Connection (CN10) and Current Sensor.	If connection and Current Sensor are OK, replace the Control PCB

A. Diode Testing Basics

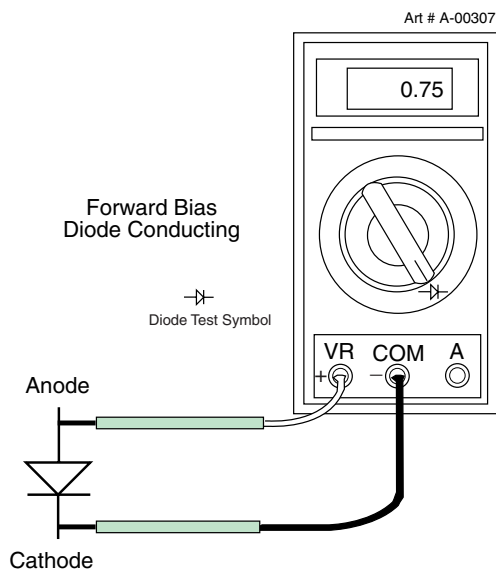


WARNING

Disconnect primary power at the source before disassembling the power supply, torch, or torch leads.

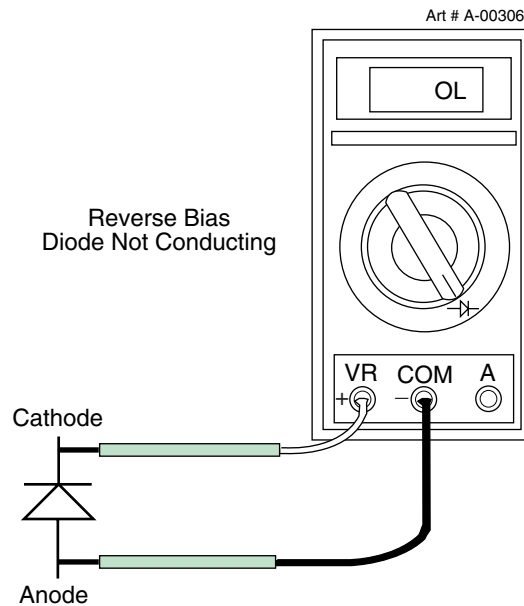
Testing of diode modules requires a digital volt/ohmmeter that has a diode test scale. Remember that even if the diode module checks good, it may still be bad. If in doubt, replace the diode module.

1. Remove AC power. Refer to Appendix 3 Wiring diagram.
2. Locate the IGBT diode module to be tested.
3. Remove P5 from IGBT module.
4. Set digital volt/ohmmeter to diode test scale.
5. Connect the volt/ohmmeter positive lead to the anode (+) of the diode and the negative lead to the cathode (-) of the diode for forward bias testing (refer to following figure). A properly functioning diode will conduct in the forward bias direction and indicate between 0.3 to 0.9 volts.



Testing Diode Forward Bias

6. Reverse the meter leads across the diode for reverse bias testing (refer to following figure). A properly functioning diode will block in the reverse bias direction and depending on the meter function will indicate an open or "OL".



Testing Diode Reverse Bias

7. Using the Figures for each test, check each diode in the module. Each diode must be checked in forward bias (plus to negative) and reverse bias (negative to plus) direction.

B. Component Tests



WARNING

Disconnect primary power at the source before taking any resistance checks.

1. Input Diode Module Board Circuit Test

- a. Check Input Diode for short per schematic located in Appendix 4.

2. IGBT Module Test

- a. With an ohmmeter set on the diode range remove P5 from the IGBT and make the following IGBT checks:

Gate PCB J5 IGBT Check		
+	-	
E1	Red	DD (1.020)
Red	E1	Open After Charging
1	Black	Open After Charging
Black	E1	DD (1.270)
E1	G1	DD (.770)
G1	E1	DD (.770)
E2	G2	DD (.770)
G2	E2	DD (.770)
E3	Red	DD (1.270)
Red	E3	Open After Charging
E3	Black	DD (.770)
Black	E3	DD (.770)
G3	E3	DD (.770)
E3	G3	DD (.770)
G4	E4	DD (.770)
E4	G4	DD (.770)

Diode Test

P5 Gate Connector			Control Connector		
1	G1 Black	TW	CN8	1	Black
2	E1 White			2	White
3	G2 Green	TW		3	Green
4	E2 Red			4	Red
5	G3 Black	TW	CN6	1	Black
6	E3 White			2	White
7	G4 Green	TW		3	Green
8	E4 Red			4	Red

Pin-out diagram

- b. If reading is not as shown, replace both IGBT modules and Gate PCB.
- c. Reconnect P5 connector.

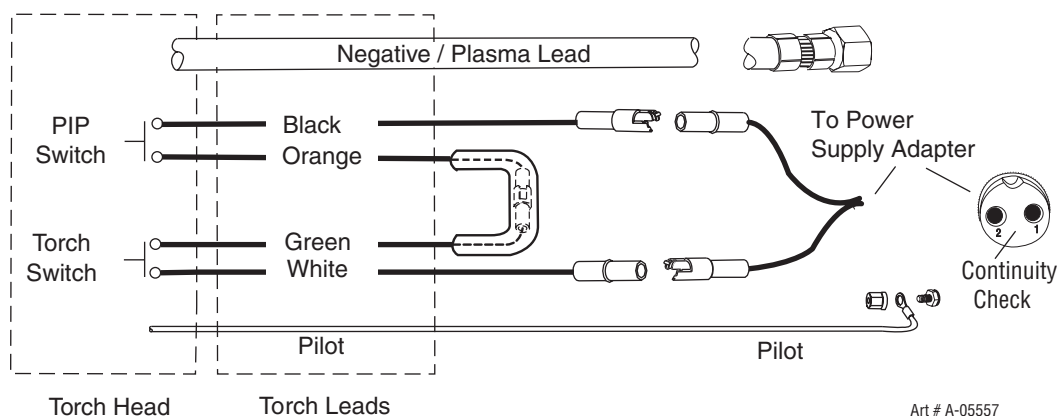
6.06 Torch Tests



Disconnect primary power at the source before disassembling the power supply, torch, or torch leads.

1. PIP and Torch Switch Adapter Check

- Disconnect input power from power supply.
- Confirm that the torch parts are in place and that they match the parts consumables label on the power supply cover.
- Refer to Appendix 2 for torch connection and access. With the power supply on it's side and the panel removed, disconnect the Power Supply Adapter from the power supply.
- While the torch trigger is depressed, complete an Ohm check on the two pins in the Power Supply Adapter. The reading should show a short (less than 1 Ohm). Refer to diagram.



Art # A-05557

2. Start Cartridge Check

- Disconnect input power and air from power supply.
- Disconnect the pilot lead (see previous diagram).
- Perform an Ohm check of the pilot lead to the negative lead. This should show a short of less than 1 Ohm. If it does not show a short, check the function of the start cartridge. The inner piece is spring loaded and should move freely. Also check other consumables for proper wear and fit.
- Connect the power supply to air and power.
- Turn the switch located on the front panel, to the "On" position.
- Press the air/set button on the front of the power supply for air flow.
- Repeat this same Ohm check of the pilot lead to the negative lead. It should now read open (no resistance).
- Turn off the air flow and check again. The Ohm meter should show a short, less than 1 Ohm.

NOTE

Every effort has been made to provide complete and accurate information in this manual. However, the publisher does not assume and hereby disclaims any liability to any party for any loss or damage caused by errors or omissions in this Manual, whether such errors result from negligence, accident, or any other cause.

SECTION 7: PARTS LIST

General Information

This parts list covers the Firepower® Model FP-35A Plasma Cutting Power Supply. Do not use these instructions or parts on any other equipment.

Provide the power supply model number and serial number when ordering parts.

If a product must be returned for service, contact your distributor. Materials returned without proper authorization will not be accepted.

Contact Information

Thermal Dynamics Technical Service Dept.

Tel: 1-800-752-7622 (1-800-PLASMA2)

Fax: 1-800-221-4401

e-mail address: tdc-tech@thermadyne.com

Replacement parts are shown on the following pages. Catalog numbers are shown below each part.

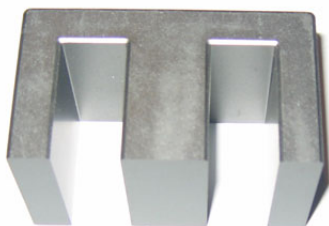
Item	Catalog #	Qty	Description
1	9-7145	1	Main Transformer / Reactor
2	9-7112	1	Core for Main Transformer
3	9-7179	1	Control PC Board
4	9-7117	1	Front PC Board
5	9-7121	1	Torch Filter PC Board
6	9-7122	1	IGBT Gate PC Board
7	9-7128	1	Input Filter PC Board
7	9-7133	1	Input Filter PC Board CE
8	9-7129	1	Input Diode
9	9-7131	1	Output Diode
10	9-7148	1	IGBT
11	9-7135	1	Electrolitic Capacitors
12	9-7139	1	Pilot Relay
13	9-7143	1	Circuit Breaker
14	9-7144	1	Control Transformer
15	9-7153	1	Current Sensor
16	9-7157	1	Pressure Sensor
17	9-7159	1	Solenoid Valve
18	9-7161	1	Air Regulator
19	9-7163	1	Cooling Fan
20	9-7204	1	Pilot Lead Nut
21	9-7222	1	Power Supply Adapter Plug

NOTE:

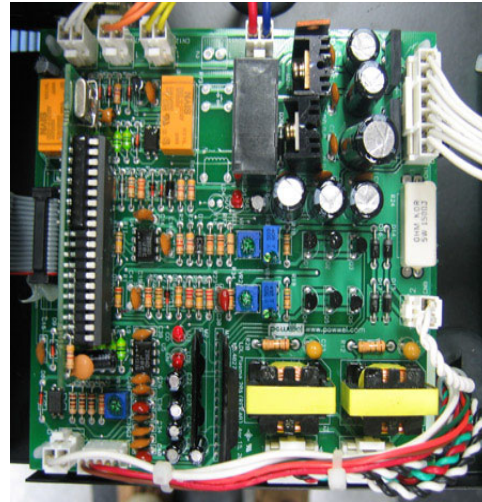
Illustrations may vary slightly from unit.



1 - Main Transformer / Reactor Assembly 9-7145



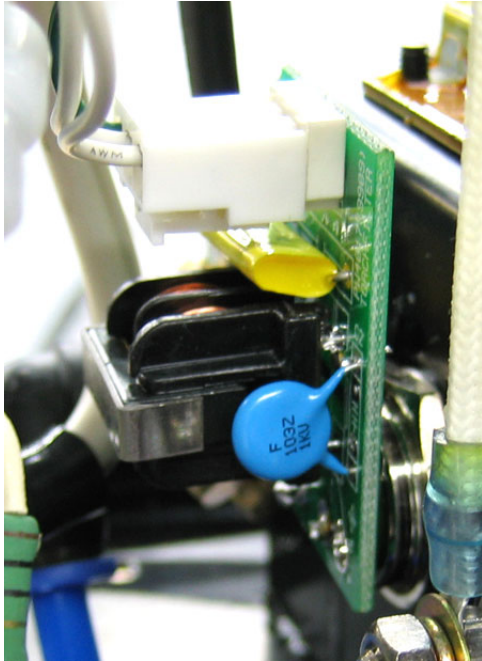
2 - Core for Main Transformer 9-7112



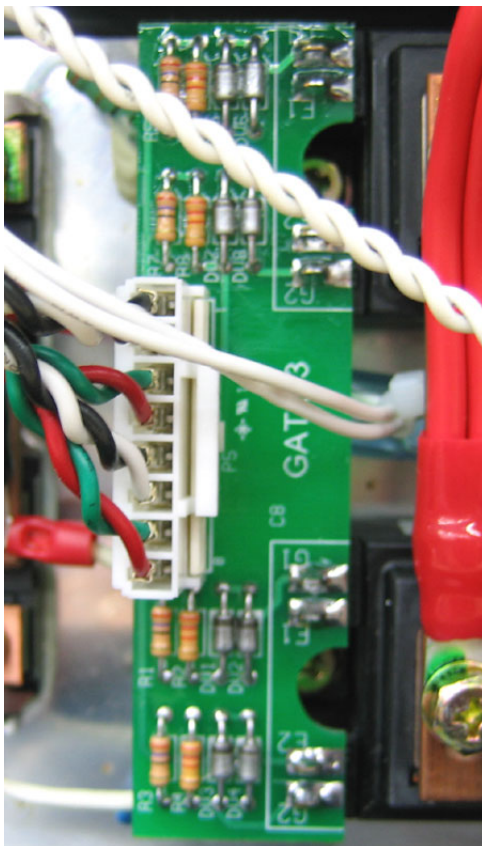
3 - Control PC Board 9-7179



4 - Front PC Board 9-7117



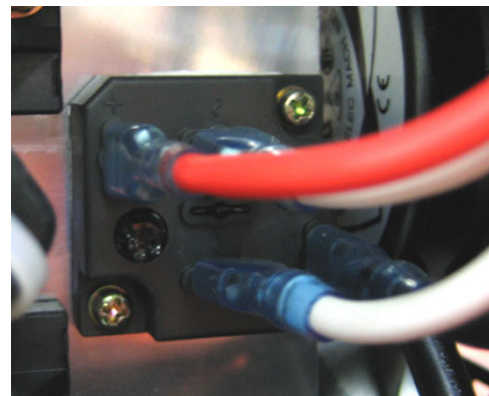
5 - Torch Filter PC Board 9-7121



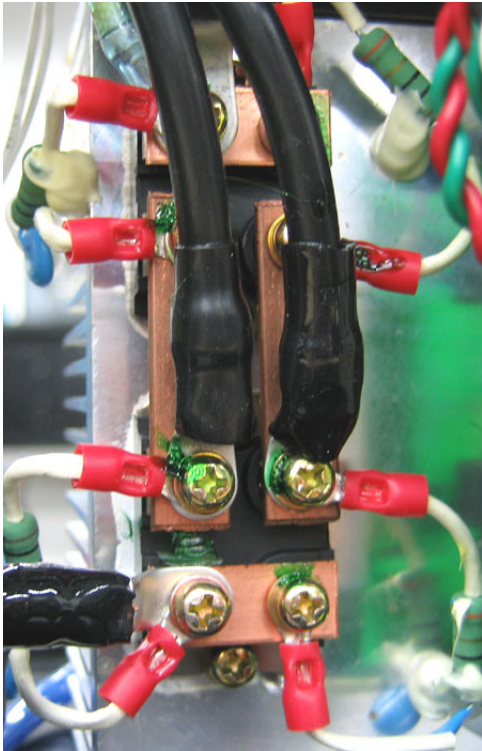
6 - IGBT Gate PC Board 9-7122



7 - Input Filter PC Board 9-7128 Non CE,
9-7133 for CE



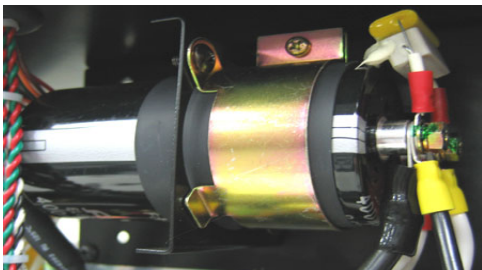
8 - Input Diode 9-7129



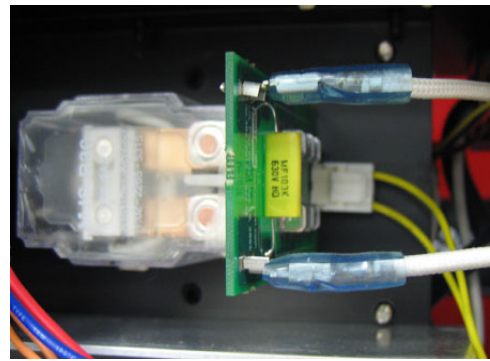
9 - Output Diode (2 shown) 9-7131



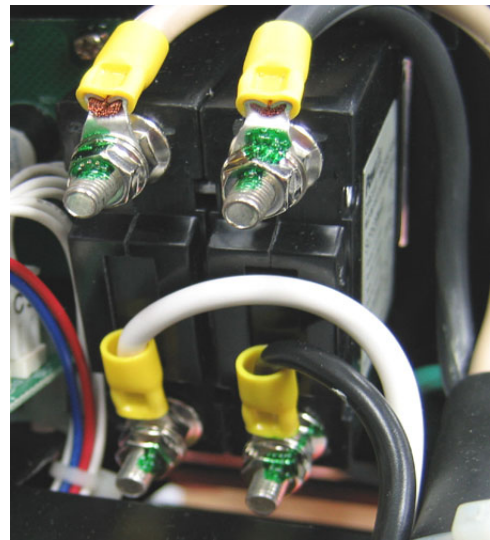
10 - IGBT (Two recommended) 9-7148



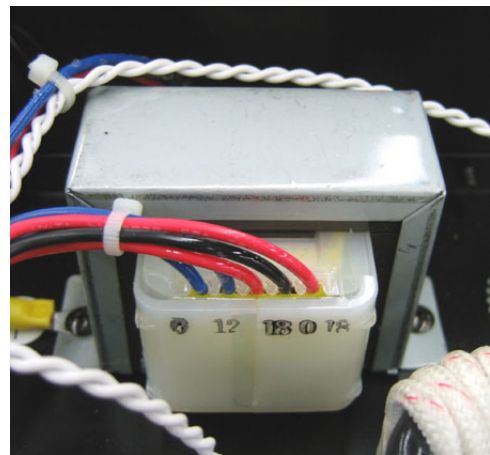
11 - Electrolytic Capacitor 9-7135



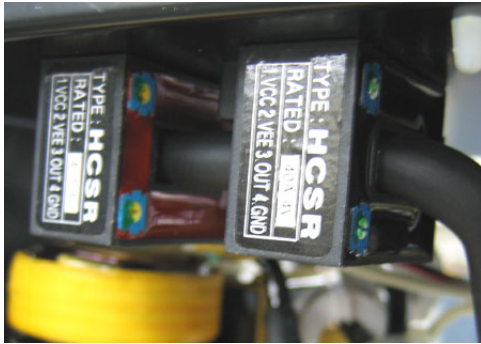
12 - Pilot Relay, PCB & harness 9-7139



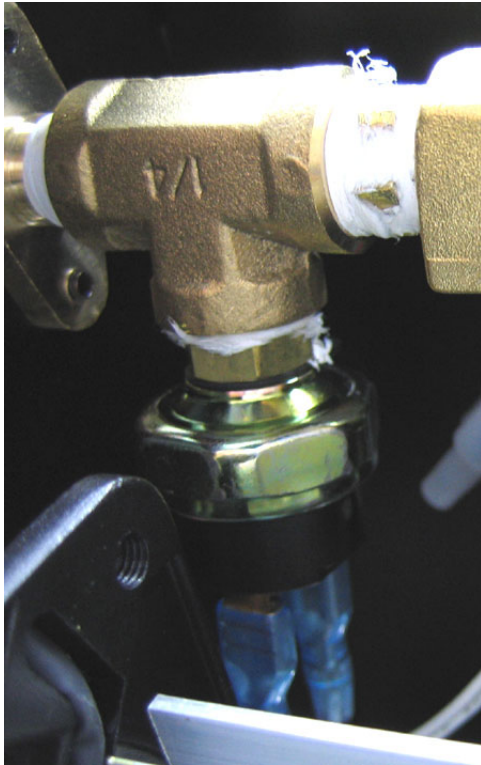
13 - Circuit Breaker 9-7143



14 - Control Transformer 9-7144



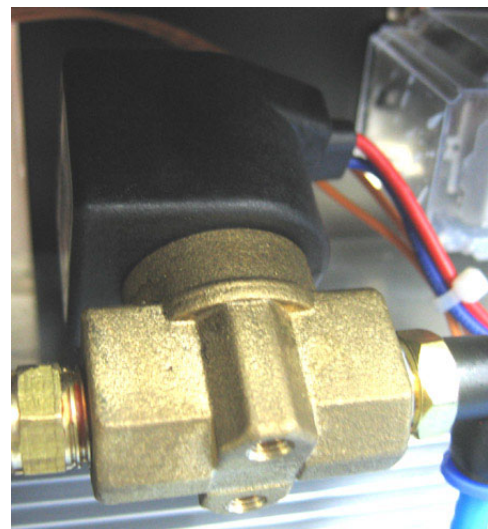
15 - Current Sensor 9-7153



16 - Pressure Sensor 9-7157



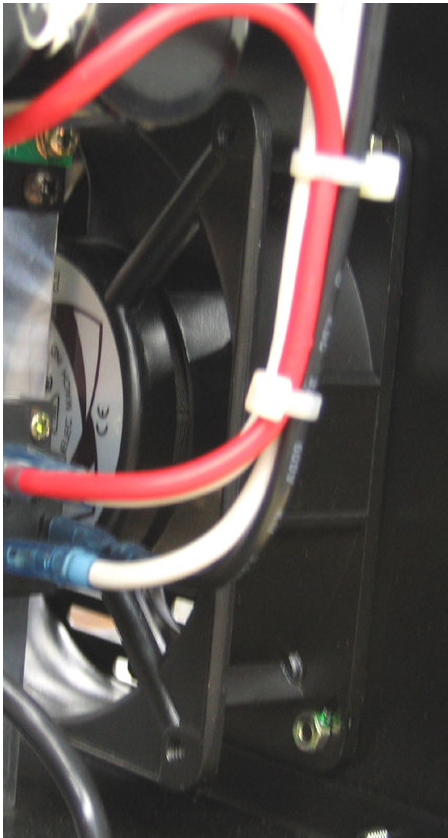
17 - Style 1, Solenoid Valve 9-7159



17 - Style 2, Solenoid Valve 9-7159



18 - Air Regulator 9-7161



19 - Cooling Fan 9-7163

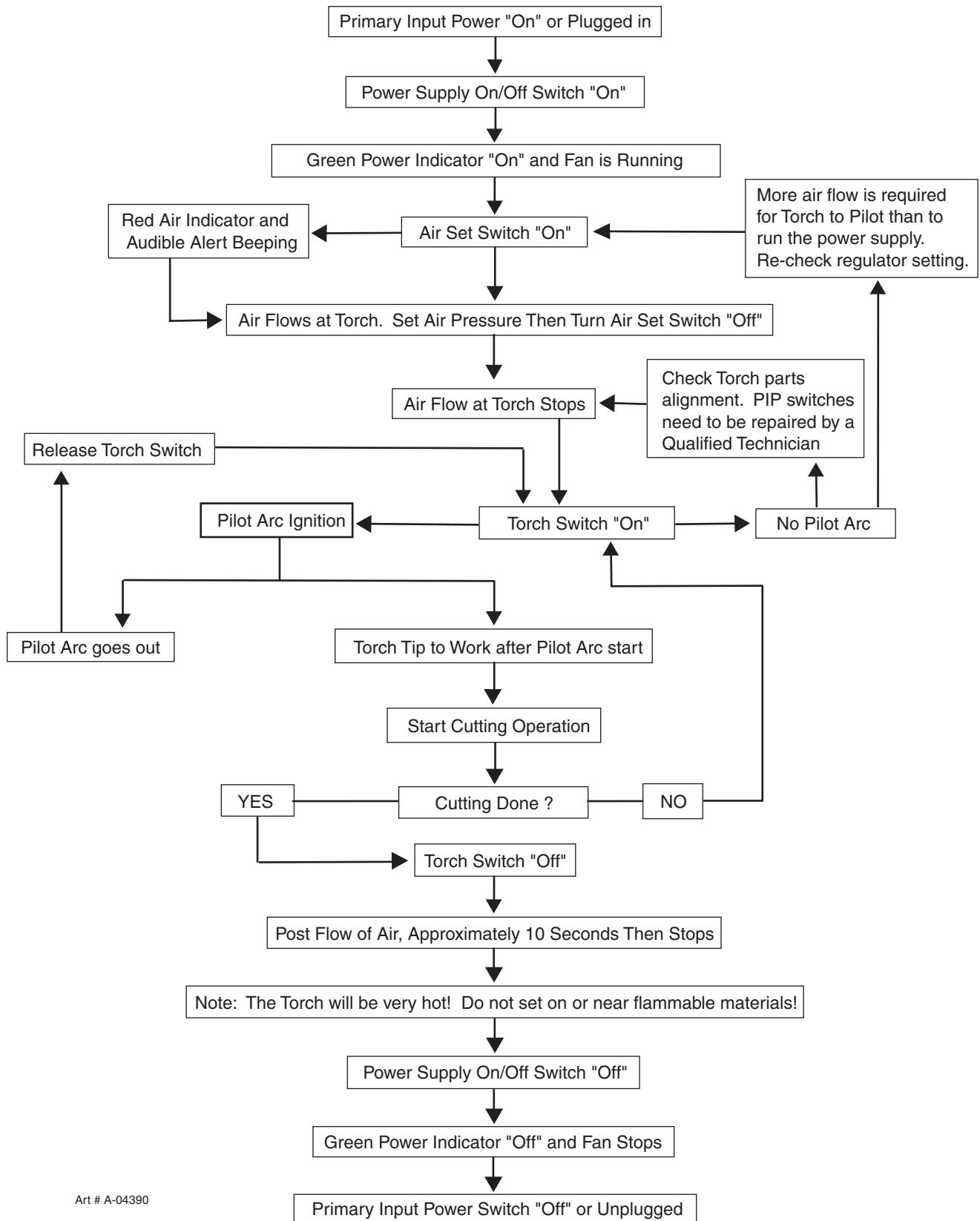


20 - Pilot Lead Nut 9-7204



21 - Power Supply Adapter Plug 9-7222

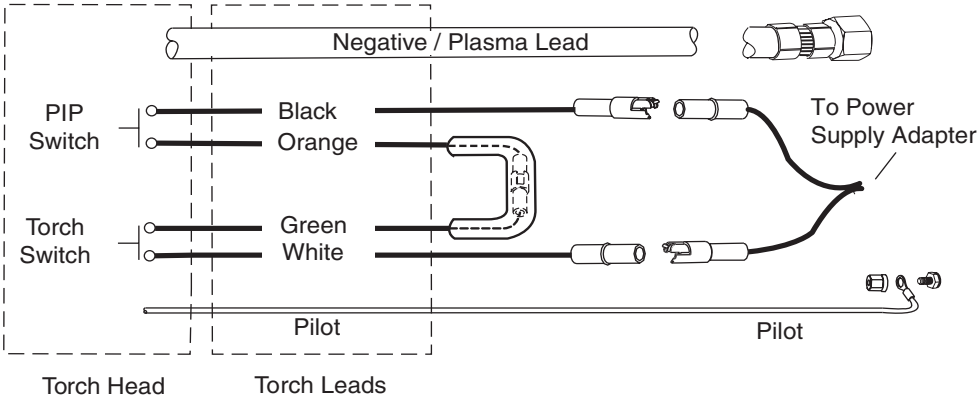
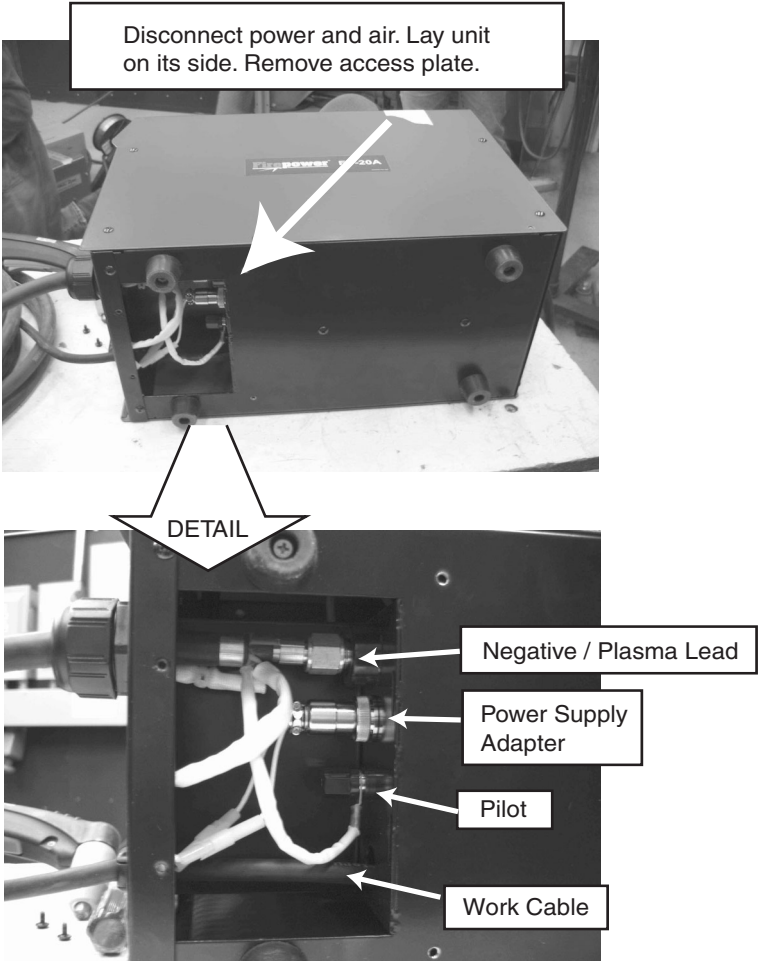
Appendix 1: Operating Sequence, Block Diagram



Art # A-04390

Appendix 2: Torch Connection

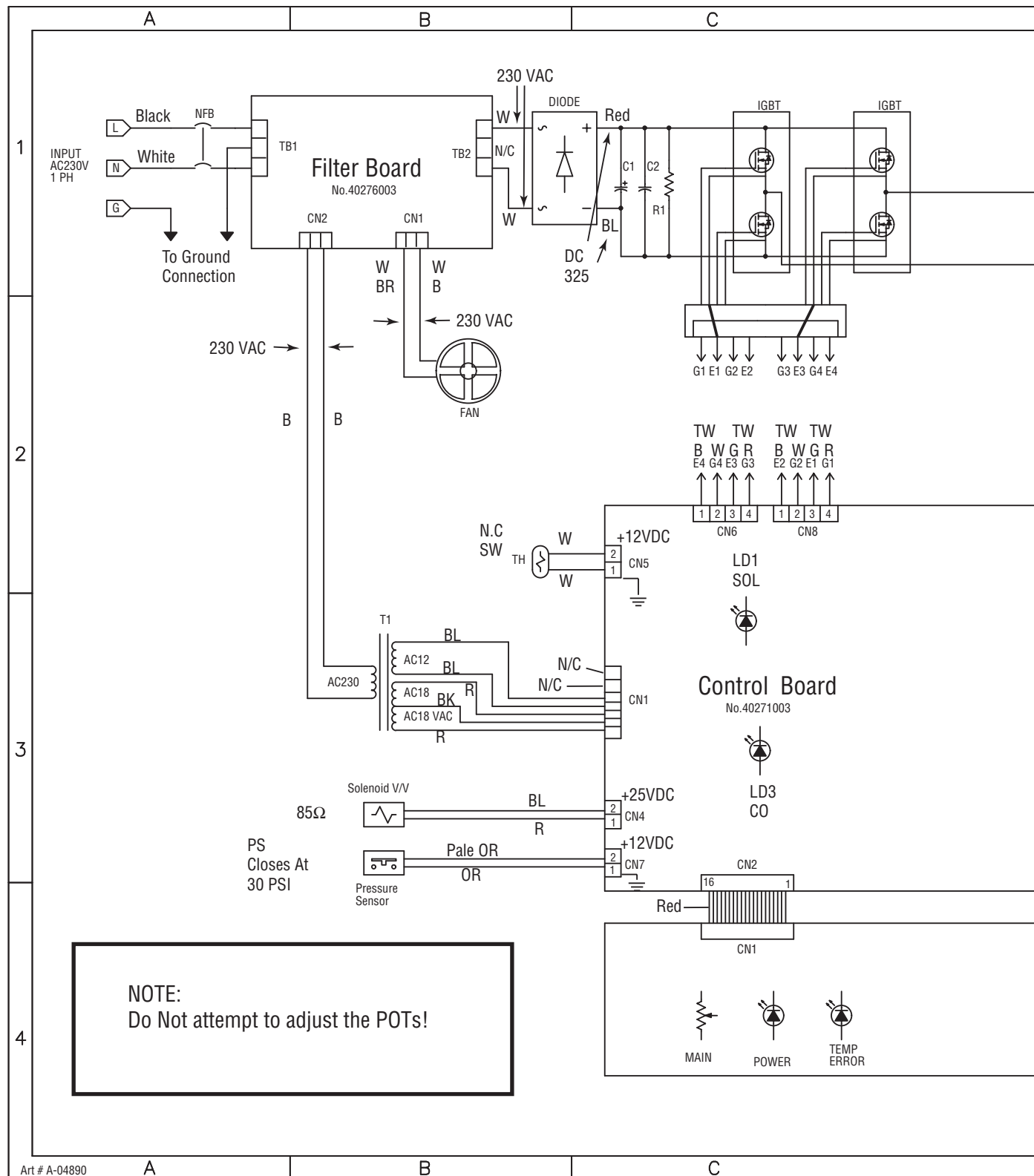
Art # A-04445

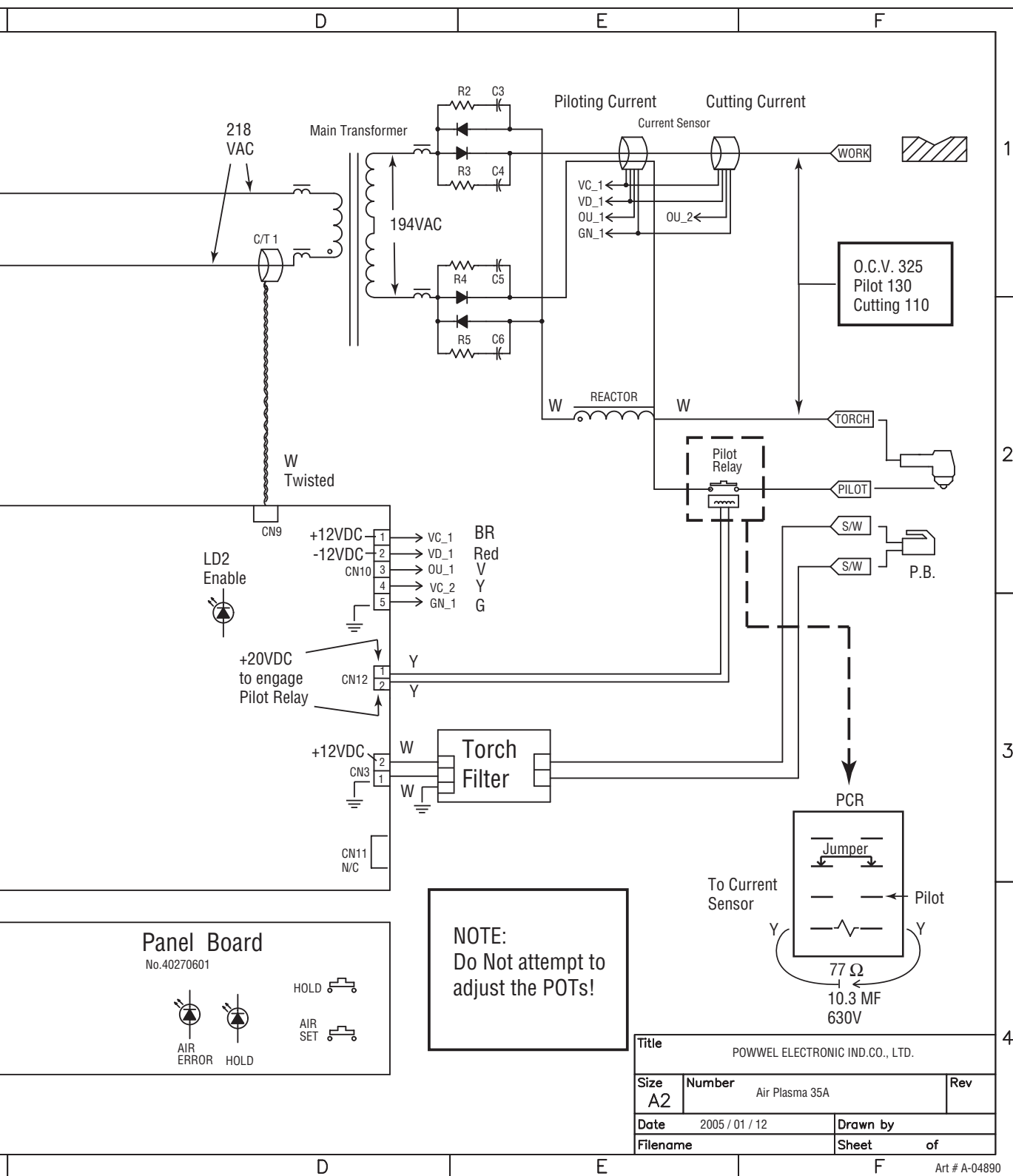


Appendix 3: Microchip Pin-Out

40 Pin Microchip													
CPU Socket on Control PCB	P2	1	2	3	4	5	6	7	8	9	10	11	12
	P1	24	22	20	18	16	14	12	10	8	6	4	2
		23	21	19	17	15	13	11	9	7	5	3	1
	P3	1	2	3	4	5	6	7	8	9	10	11	12

Manual 0-4695





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